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ABSTRACT

How well items of information which comprise a text are learned may depend upon the semantic and syntactic relationships (ideational bonds) which exist among those items. To determine if the ability of learners to recall text information is influenced by the location of the information within the text and by syntactic contrasts among informational items, 22 college students were given a passage to study and then were administered a completion-type recall test. The results showed that items of information located in a context of topically related information are more readily recalled than those located in a topically unrelated context. However, items which were contrasted with one another through syntactic cues were recalled no better than those which occurred alone and unconnected. These findings suggest that if logical relations are built into the semantic structure of texts, learning from the texts will be improved. (FL)

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Development of Ideational Bonds in Text via Relational and Locative Cues

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Much of the knowledge which comprises an academic discipline is conveyed to students via textual materials. From a pedagogical perspective, the most effective textual materials have structures which facilitate students' efforts to find relationships among items of information contained within the materials. These relationships, or alternatively, "ideational bonds," ensure that new information is meaningfully integrated into students' existing knowledge structures.

A question of significant educational importance is: What characteristics should textual materials have to ensure that ideational bonds are formed? The intent behind the present investigation was to determine if the memorial stability of text information is influenced by (a) the contextual location of information and (b) syntactic contrasts made among informative propositions.

When informative propositions are encountered in a meaningful format such as prose, they interact with learners' existing ideational systems (Ausubel, 1977; Glynn & Di Vesta, 1977). In the present investigation, an assumption was made that propositions which share a semantic base are processed and subsumed in light of their relation to one another. This assumption is consistent with a cognitive interpretation of the learning process which holds that new information has a greater probability of being subsumed into and stabilized within learners' knowledge structures if the information in question is perceived as part of a unified whole, rather than as a discrete, isolated unit (Jenkins, 1974). It was hypothesized that the recall of text propositions located in a context of topically related information would be superior to that of propositions located in a context of topically unrelated information.

Relations of a syntactic nature were also manipulated in the present study. Propositions were contrasted with each other via word-arrangement cues. A prediction was made that syntactic contrasts made among propositions in the text would help learners to differentiate among propositions and allocate them with greater precision to conceptual categories within their knowledge structures. Contrast relationships may clarify ideas within conceptual systems and serve to stabilize the internal representation of those ideas. The contrasted propositions would remain identifiable and be easily dissociated (Ausubel, 1977) at recall.

Method

Experimental materials consisted of the text to be studied and and completion-type recall test.

Subjects

The subjects were 22 (11 females and 11 males) undergraduate student volunteers solicited from introductory education courses

at The Pennsylvania State University.

Text

The text was an adaption of Gagnè and Rothkopf's (1975) solar system passage. The text was contained in three main paragraphs, each of which was about an inhabited planet of the solar system. Tested information was generated from a matrix comprised of three planet/inhabitant names and 18 attributes (see Table 1).

Text Information

Within a single attribute dimension, such as temperature, the informative proposition associated with one planet was paired with the proposition associated with another planet, and inserted in the text in the form of a complex sentence. This was accomplished by syntactically contrasting the proposition of the one planet with the proposition of the other planet. Connective and prepositional terms which included "although," "unlike," "as opposed to," etc., were employed in what were termed the contrast sentences. An example of a contrast sentence is "Nebon is shaped like an hourglass, unlike Parfis which is shaped like a cigar." The proposition about the remaining third planet (or inhabitant of the planet) in the name/attribute matrix, in this case Tarran, was represented alone in the form of a simple sentence. For example, "Tarran is shaped like a pear." Contrast sentences and simple sentences were systematically inserted into the text.

One of the two propositions of information within each contrast sentence was randomly assigned to the category of Set A propositions; the remaining proposition was assigned to the category of Set B propositions. The to-be-tested propositions which comprised the content of the text consisted of the following: 18 contrast-sentence Set A propositions, 18 contrast-sentence Set B propositions, and 18 simple-sentence propositions.

Contextual Location

Contrast and simple sentences were assigned to intra-context and extra-context locations. The overall outcome of the assignment of contrast sentences to particular planet paragraphs was that the two propositions of each contrast sentence were positioned in equal numbers in both intra-context locations (i.e., a match between proposition and paragraph) and extra-context locations (i.e. a mismatch between proposition and paragraph). For example, if the sentence, "Nitrogen constitutes Tarran's atmosphere, in contrast to Nebon whose atmosphere is chiefly ozone," were to appear in the planet Tarran paragraph, then the proposition of information about Tarran's atmosphere would have an intra-context location while the proposition about Nebon's atmosphere would have an extra-context location. The simple sentences which contained a single proposition were also assigned to both intra-context and extra-context locations.

Instructions and Testing

In a group, subjects were instructed to "determine the six most important items (in your opinion) in each planet paragraph and learn them" in preparation for a completion-type 54-item recall test which was administered after a 30-minute study period.

Design

The design of the study implied a 3 x 2 analysis of variance which was comprised of the following within-subjects factors: type of proposition (contrast sentence -- Set A; contrast sentence -- Set B; and simple sentence) and contextual location (intra-context and extra-context).

Results

The analysis of variance yielded a significant effect due to contextual location, $F(1, 21) = 33.65$, $p < .001$, $MS_e = 56.03$. As hypothesized, propositions in intra-context locations were recalled better than propositions in extra-context locations (see Table 2).

The main effect of type of proposition and the interaction effect were not found to be significant. In contrast to expectations, propositions that were syntactically contrasted (i.e., Set A and Set B propositions) were equivalent in recall to those than were not contrasted (i.e., simple-sentence propositions).

Discussion

Semantic relations were found to influence the retrievability of propositions. From a cognitive perspective, location within a neighborhood of conceptually similar items of information contributes to the production of a unified system of ideas, that is, to "belongingness." Ausubel (1963) states, "Deliberate intention to learn (i.e., in response to explicit instructions) is not essential as long as belongingness is present" (p. 234). He further contends, "in the case of meaningful learning material, belongingness is a reflection of functional or logical relatedness" (p. 180). Belongingness among the propositions which comprised the present text was generated via intra-context placement. Intra-context placement helped to guarantee that propositions were allocated to appropriate conceptual categories within a learner's knowledge structure. As a result, intra-context propositions were more likely to be available at the time of retrieval.

In contrast to expectations, propositions which were contrasted with one another in the same sentence were recalled no better than items which occurred alone and unconnected in sentences. It was reasoned that a contrast made between ideas would clarify their distinctions and facilitate the "process of differentiating the propositions in question from other plausible alternatives in the learning material" (Ausubel, 1963, p. 195). The secured outcome, however, suggests that implementation of a syntactic contrast was

sufficient to induce elaborative processing of the linked propositions. It should be remembered that the information elements which comprised each pair of contrasted propositions were derived from the same attribute category. This high degree of semantic similarity may have neutralized any retrieval benefits evoked by the contrast.

Educators can build logical relations into the semantic structure of instructional texts to guarantee that significant learning outcomes are realized. Minimally, authors should strive to format their texts so that topically related ideas are segregated in neighborhoods which share a conceptual base. In addition, meaningful relationships should be established by contrasting and comparing key concepts. These aspects of quality text design are important because as students progress from decision criteria which are externally imposed during formal instruction to those which are internally generated during informal, self-learning experiences, they come to depend more heavily upon the cues the author has woven into the fabric of the text.

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TABLE 1

Matrix of Tested Items of Information

Attributes	Names of Planets								
	Tarran			Nebon			Parfis		
1. Temperature	300°	(1)	(E-N)	90°	(2)	(I)	200°	(3)	(I)
2. Rotation	400 days	(3)	(I)	800 days	(1)	(E-P)	2000 days	(2)	(I)
3. Shape	pear	(3)	(E-P)	hourglass	(1)	(I)	cigar	(2)	(E-N)
4. Atmosphere	nitrogen	(1)	(I)	ozone	(2)	(E-T)	helium	(3)	(E-N)
5. Color	purple	(2)	(E-P)	blue	(3)	(I)	green	(1)	(I)
6. Core	iron	(1)	(I)	copper	(3)	(E-P)	lead	(2)	(E-T)
7. Terrain	desert	(1)	(E-N)	swampy	(2)	(I)	mountainous	(3)	(E-T)
8. Gems	sapphires	(3)	(E-N)	opals	(1)	(E-P)	emeralds	(2)	(I)
9. Plant life	grasses	(3)	(I)	seaweeds	(1)	(I)	vines	(2)	(E-N)

TABLE 1 (Continued)

Attributes		Names of Inhabitants: Garilli			Breeps			Congats		
10.	Shape	barrels	(2)	(I)	pyramid	(1)	(E-T)	balls	(3)	(I)
11.	Size	mice	(1)	(E-P)	housecats	(3)	(E-T)	bears	(2)	(I)
12.	Color	brown	(2)	(I)	grey	(3)	(E-P)	red	(1)	(E-T)
13.	Skin covering	shells	(2)	(E-N)	spikes	(1)	(I)	fur	(3)	(E-T)
14.	Sound	whistling	(3)	(E-N)	buzzing	(2)	(E-P)	thumping	(1)	(I)
15.	Diet	insects	(3)	(I)	fish	(2)	(I)	meat	(1)	(E-N)
16.	Home	caves	(1)	(I)	trees	(2)	(E-T)	huts	(3)	(I)
17.	Locomotion	sliding	(2)	(E-P)	hopping	(3)	(I)	rolling	(1)	(I)
18.	Death	disease	(2)	(I)	predators	(3)	(I)	earthquakes	(1)	(E-T)

Type of Information

(1) Contrast Sentence -- Set A
(2) Contrast Sentence -- Set B
(3) Simple Sentence

Information Location

(I) intra-context location
(E-T) extra-context location in Tarran paragraph
(E-N) extra-context location in Nebon paragraph
(E-P) extra-context location in Parfis paragraph

Table 2

Mean Proposition Recall Scores

	Contrast Sentence				Simple Sentence	
	Set A		Set B			
	Intra-context	Extra-context	Intra-context	Extra-context	Intra-context	Extra-context
X	4.77	3.36	4.41	3.27	4.46	3.68
σ	2.09	1.94	1.89	2.00	1.54	1.59